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The Technology Assessment Board approves the release of this report. The views expressed in this report are not necessarily those of the Board, OTA Advisory Council, or of individual members thereof.

Preface

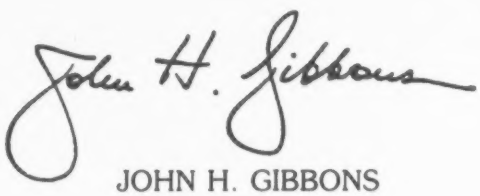
This booklet is designed to provide Members of Congress and their staffs with:

- announcements of recently published reports;
- notices of publications in press;
- brief summaries of our current work projects, organized by OTA Division and Program, and the dates currently projected for publication; and
- lists of selected publications of interest.

The projected publicaton dates are only estimates because schedules must be flexible to allow for uncertainties inherent in research, and because OTA must frequently shift its priorities to match changing Congressional needs.

Legislative deadlines often require OTA to release specific information from an assessment before completion of the project. Frequently this information is conveyed through a staff briefing, testimony, or a technical memorandum.

We will update this booklet periodically and welcome your comments on its value. For additional copies of this booklet, please contact our Publishing Office (202) 224-8996.



JOHN H. GIBBONS
Director

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RECENT PUBLICATIONS

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Those reports stating that summaries are available can be obtained by calling 224-8996.

Full reports are provided to Members and their staffs for congressional use, if available. Others interested in the full reports can purchase them from the U.S. Government Printing Office or through the National Technical Information Service. Refer to the current OTA Publications Listing (OTA-P-58) or call OTA's Publishing Office (224-8996) for ordering information.

Assessment Reports

Wetlands: Their Use and Regulation

Both the development and the preservation of wetlands—swamps, marshes, bogs, and other areas that are periodically saturated with water—offer benefits to individual users of wetlands as well as to society as a whole. For example, when drained or filled, some wetlands may be converted into highly productive farmland or choice residential or commercial property. Valuable oil, gas, and timber resources may also be extracted from some wetland areas. Many other technological activities, such as the construction of dams, levees, breakwaters and jetties, and bridges and highways, often take place in wetlands. Similarly, undeveloped wetlands may provide flood control, fish and wildlife habitat, erosion protection, pollution control, and groundwater recharge.

In the past, the values of undeveloped wetlands have largely been ignored or seen as less than those of developed or technologically modified wetlands. As a result, approximately 30 percent of the Nation's wetlands have been modified in some way by various technological activities. During the last decade, the importance of the natural functions of wetlands has received increasing recognition. In response to concerns about wetlands, many Federal and State laws now influence the development of wetlands and regulate their use through measures such as acquisition, economic incentives, and permitting.

Proposals to develop wetlands have frequently led to controversy. To provide a framework for future debates on this issue, OTA will evaluate:

- the effects of technological activities on wetlands,
- technological and nontechnological options for mitigating undesired impacts,

- the functional values of different types of wetlands,
- problems associated with weighing the benefits of technological activities in wetland areas against the functional values of the wetlands that may be lost, and
- various approaches to wetlands use.

Published: March 1984. Summary available.

Technologies To Sustain Tropical Forest Resources

Each year 1 to 2 percent of the world's remaining tropical forests are converted to other land uses or to wasteland. Where cleared land is developed for sustained agriculture, deforestation can be beneficial. But most land now being cleared cannot sustain farming or grazing with available technologies, so it is abandoned after a few years. Often the forests do not regrow because of highly weathered soils and harsh climates. Thus, highly productive but underused forest resources are giving way to grasslands and deserts of low productivity.

Deforestation has economic and environmental consequences that jeopardize U.S. imports of agricultural germ plasm, pharmaceuticals, chemical feedstocks, foods, drugs, animals for medical research, tropical hardwoods, and veneer and wood products. Also in jeopardy are U.S.-funded development projects in tropical countries, U.S. migratory wildlife species, and stability of global climates. Tropical deforestation places pressure on world oil supplies and is an important causal factor in the increasing number of refugees seeking U.S. entry.

The U.S. Agency for International Development (AID), the United Nations (U.N.) agencies, and the World Bank have increased funding for forestry severalfold in the past 5 years. American corporations and nonprofit institutions also have been increasingly involved in the search for solutions to tropical deforestation problems. Most importantly, many tropical nations' governments recognize that deforestation constrains their economies and their development options; they are now making institutional changes to slow deforestation and to accelerate reforestation.

The United States is recognized for its leadership in bringing the deforestation problems to world attention and for the technical versatility it has to address the problem. Sustaining tropical forest resources can be helped or hindered by applications of certain technologies. OTA will assess: 1) dimensions of the tropical deforestation problem; 2) impacts of technologies, both conventional and new, that the United States may apply to enhance use and management of forest resources; 3) the role that U.S.-funded agencies, such as AID, Peace Corps, the U.N., and the World Bank, play in developing

improved technologies; 4) improved mechanisms for transferring such technologies to tropical nations and to tropical regions of the United States; and 5) the special strengths of U.S. institutions in relevant science and technology.

Published: Background papers, #1 *Sustaining Tropical Forest Resources: Reforestation of Degraded Lands* and #2 *Sustaining Tropical Forest Resources: U.S. and International Institutions*, published May 1983. Full report, March 1984. Summary available.

Nuclear Power in an Age of Uncertainty

The nuclear reactor manufacturing industry is facing a period of extreme uncertainty. There have been no reactor orders since 1978, and it is quite possible that none will be placed in time to keep existing design and manufacturing capabilities intact. The principal reason has been the decline in electricity demand growth that has greatly reduced the near-term need for new generating capacity. Other factors and perceptions about nuclear power—e.g., safety concerns, costs, reliability questions—have also contributed to the industry's difficulties. In order for the nuclear option to be available, and to be acceptable to the utilities, regulators, and the public, substantial technical and institutional changes may be needed.

This assessment examines the major technical considerations about the future of conventional nuclear power and how these technologies can affect economic, regulatory, and institutional issues (e.g., Government and industry responsibilities) that govern that option.

Technical issues studied include potential improvements to existing reactors such as higher fuel burn-up and increased reliability; reoptimized and standardized light water reactors; and different reactor types such as HTGR or CANDU reactors. The consequences of these possible changes on licensing, reactor costs, safety, industrial structure, and public perception are examined.

Published: February 1984. Summary available.

Commercial Biotechnology: An International Analysis

In the past 10 years, dramatic new developments in the ability to select and manipulate genetic material have sparked unprecedented interest in the industrial uses of living organisms. Following the first successful directed insertion of foreign DNA in a host micro-organism in 1973, scientific researchers in the United States and other countries began to recognize the potential for directing the cellular machinery to develop new and improved products and processes in a wide diversity of industrial sectors. Potential industrial applications of novel genetic techniques include the production of new drugs,

food, and chemicals; the degradation of toxic wastes; and the improvement of agricultural products. Thus, these new techniques could have a major economic impact on industries throughout the world.

This report assesses the competitive position of the United States with respect to Japan and four European countries—the Federal Republic of Germany, the United Kingdom, Switzerland, and France—believed to be the major competitors in the commercial development of "new biotechnology." Although the United States is currently the world leader in both basic science and commercial development of new biotechnology, continuation of the initial preeminence of American companies in the commercialization of new biotechnology is not assured. Japan and other countries have identified new biotechnology as a promising area for economic growth and have therefore invested quite heavily in R&D in this field. Congressional policy options for improving U.S. competitiveness in new biotechnology are identified in this report.

Published: January 1984. Summary available.

U.S. Passenger Rail Technologies

The 1982 announcement by the privately chartered American High Speed Rail Corp. of a planned $3 billion high-speed passenger rail corridor between Los Angeles and San Diego stimulated congressional interest in the introduction of high-speed and other advanced rail technologies, including magnetic levitation, in the United States. This interest is also reflected in the growing number of private and publicly funded feasibility studies of these technologies in selected regions and transportation corridors. OTA assessed these intercity passenger rail technologies, foreign experience with high-speed rail, and the potential impacts of their introduction in the United States.

Published: December 1983. Summary available.

International Competitiveness in Electronics

There is a growing concern that key U.S. industries are declining in their international competitive positions. The electronics industry is particularly significant because it occupies a strategic position as a technological driving force for other industries that use products like semiconductors and computers. The OTA assessment looks at three sectors of this industry: consumer electronics (where the United States has suffered heavily from Japanese competition); semiconductors (where a strong U.S. position is under challenge); and computers (where the United States still appears to lead the world).

The assessment focuses on those major contributors to the competitiveness of the electronics industry that could most readily be affected by U.S. Govern-

ment policy. In each case, a comparison is made between the United States, Japan, and (to a lesser extent) Western Europe. These major factors are: 1) commercialization of research, development, and design; 2) manufacturing techniques and resources; 3) finance, including both private and public sources of funds; 4) human resources, both quantity and quality; and 5) governmental/industrial policies.

Published: November 1983. Summary available.

Water-Related Technologies for Sustainable Agriculture in U.S. Arid and Semiarid Lands

Freshwater is a controlling factor of U.S. agricultural productivity. In recent years, the availability of high-quality freshwater for agriculture, especially in the arid and semiarid United States, has become a major concern. In particular, competition for available water supplies, overdraft of underground aquifers, and deteriorating water quality have contributed to severe water supply problems for arid and semiarid U.S. agricultural lands (those receiving about 20 inches or less of rainfall annually).

The principal farming systems in arid and semiarid U.S. lands are irrigation agriculture, dryland farming, and ranching. Irrigation agriculture is one of the most seriously affected by reduced water supplies. This farming system accounts for over 80 percent of all consumed water withdrawn from streams and underground aquifers. About 90 percent of U.S. irrigated land is in the 17 Western States where water is in short supply. In California, Arizona, New Mexico, Nevada, Utah, Wyoming, and Idaho, for example, over 80 percent of the crops are produced with irrigation. Agricultural water supplies suffer from declining water tables as well as agriculture's inability to compete on the open market for the water that is available. Energy costs become a particularly critical factor as water must be transported from greater distances or lifted from deeper aquifers. In addition, many conventional agricultural systems use available water inefficiently. The seriousness of the problem necessitates an assessment of present and emerging water-related technologies and their potential for sustaining arid and semiarid agriculture in the United States.

This assessment focuses on the opportunities of present and emerging technologies to provide long-term sustainable agricultural productivity by increasing efficiency of water use and reducing agricultural water demands in arid and semiarid U.S. lands. The ability of such technologies to improve water quality of agricultural runoff and the associated socioeconomic impacts also is examined.

Technologies considered include those that require modification of existing systems to maintain the present style of agriculture and those that involve

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fundamental changes through the adoption of low-water-demand biological technologies and systems. The assessment includes a critical review of data on the magnitude of the arid/semiarid water problem, potentials for alternative supplies, and possible legal and institutional mechanisms supportive of the adoption of sound agricultural water-related technologies.

Published: Background paper, *Water-Related Technologies for Sustainable Agriculture in Arid/Semiarid Lands: Selected Foreign Experience*, published May 1983. Full report, October 1983. Summary available.

Assessment of Maritime Trade and Technology

World trade now totaling nearly $2 trillion—a fourfold increase in the past two decades—has become a dominant factor in the economic performance of both industrialized and developing countries. The international shipping industry exists to serve that trade. In the past two decades its capacity has grown almost 250 percent, as well as changed in character in response to new trading conditions and cargo demand. However, both trade and shipping volume reached a plateau in recent years, and the industry's concerns about meeting demands for growth have been replaced by concerns about managing overcapacity and improving efficiency. Prospects for merchant shipping and shipbuilding therefore must be evaluated in terms of these changing trade patterns.

Because of their concerns about the viability and productivity of U.S. maritime industries as well as the future U.S. position in world trade, the House Committees on Merchant Marine and Fisheries and on Ways and Means jointly requested OTA to prepare this assessment. The committees asked OTA to undertake an analysis and forecast of long-term trends in global seaborne trade and maritime technology in relation to the U.S. maritime industry.

This assessment of Maritime Trade and Technology traces prevailing conditions and dominant trends that are important to the way the Federal Government assumes its responsibility for developing and implementing policy. The report contains analyses of the world outlook for trade, shipping, and shipbuilding. It identifies the extent of U.S. participation in these enterprises. It analyzes the U.S. shipping and shipbuilding industries and identifies certain weak and strong attributes. It discusses trends in technology as well as in the policies of the United States and of our major trading partners.

OTA has found that, although there are both healthy and troubled segments of the U.S. maritime industries, all sectors are becoming increasingly dependent on Federal policy decisions. And, with increasing competition in world trade as well as shipping services to carry that trade, intervention by all governments is more and more prevalent.

Published: October 1983. Summary available.

Other Reports

- Impacts of Neuroscience (Background Paper)
- Remote Sensing and the Private Sector: Issues for Discussion (Technical Memorandum)
- Encouraging High-Technology Development (Background Paper)
- Salyut: Soviet Steps Toward Permanent Human Presence in Space (Technical Memorandum)
- Assistive Devices for Severe Speech Impairments (Case Study)
- Technology and Learning Disabilities (Case Study)
- Scientific Validity of Polygraph Testing: A Research Review and Evaluation (Technical Memorandum)
- Abstracts of Case Studies in the Health Technology Case Study Series
- Plants: The Potentials for Extracting Protein, Medicines, and Other Useful Chemicals (Background Paper)

PUBLICATIONS IN PRESS

The following assessment reports were in various stages of production at press time for this booklet.

The report availability date listed is OTA's anticipated production schedule for public release and is subject to priority changes to meet congressional needs. Please call OTA's Publishing Office on 224-8996 for available cost and ordering information.

Computerized Manufacturing Automation: Employment, Education, and the Workplace

New computer and communication technology are providing the foundation for a new wave of industrial automation including such technologies as computer-aided design (CAD), computer-aided manufacturing (CAM), robotics, and manufacturing management systems. These technologies can be merged to form flexible manufacturing systems.

While computerized (or "programmable") automation is expected to enhance the productivity and competitiveness of industries that use it, it is also likely to have significant, broader impacts on the Nation's economy, industrial structure, and work force. Computerized automation will thus present both opportunities and problems to Federal policymakers concerned with the state of the U.S. economy, international trade, employment, and training programs.

This work assesses:

- trends and the state of research and development in computerized manufacturing technologies over this decade;
- the development of industries producing computerized manufacturing equipment, software, and services;
- the potential utility of computerized automation to various categories of manufacturing industries;
- impacts on employment—job loss, job creation, job redefinition; new skill needs; and workplace quality;
- implications for education and training, general technological literacy, specialized vocational skills, and scientific and engineering expertise; and
- the impacts of Federal policy options on the development and use of computerized automation systems in U.S. manufacturing.

Report availability: Full report, April 1984. *Exploratory Workshop on the Social Impacts of Robotics* (Background Paper), published February 1982. *Automation and the Workplace: Selected Labor, Education, and Training Issues* (Technical Memorandum), published March 1983. Call 226-2182 for further information.

Managing Commercial High-Level Radioactive Waste

More than three decades into the nuclear age, this country still has no permanent disposal facilities for commercial high-level radioactive waste. This assessment focuses on technologies for disposal of commercial high-level waste (spent fuel or solidified waste from reprocessing). A clear understanding of the problem of managing radioactive waste from its generation to final disposal requires comprehensive analysis of the interactive relationships among possible storage and disposal technologies; transportation systems; regulatory considerations; and Federal, State, and local jurisdictional prerogatives. The OTA study uses a systems analysis technique to evaluate a range of strategies for developing and deploying a commercial high-level radioactive waste disposal system. This study describes major policy issues that were resolved by the Nuclear Waste Policy Act of 1982, and analyzes other key issues which remain to be addressed in the radioactive waste mission plan to be prepared by the Department of Energy, or in subsequent legislation.

Report availability: Summary published April 1982, full report, Spring 1984.

Acid Rain and Transported Air Pollutants: Implications for Public Policy

Acid rain has been the focus of much debate during the Clean Air Act deliberations of the 97th and 98th Congresses. The controversy over transported air pollutants—of which acid rain is one example—revolves around suspected damage to lakes and streams, forests and soils, agricultural crops, building materials, and human health. Some individuals and groups believe that more stringent measures should be taken now by Congress to control pollutant emissions. Others, pointing to the uncertainties in our knowledge of the causes and consequences of transported air pollutants, are concerned that such action may be premature.

Current understanding of transported pollutants allows a description of potential resource damage—regions of the United States most susceptible to damage—but not a precise quantification. The costs of likely control strategies, and who might bear these costs, can be described, but the effectiveness of these control strategies for avoiding resource damage cannot be calculated with confidence. Given the difficulty of quantifying the relationship between emissions reductions and the prevention of resource damage, policy decisions may have to be based on the risks of resource damage, the risks of inefficient control expenditures, and the distribution of these risks among different groups and regions of the country.

The assessment characterizes the potential benefits of acting now to abate long-range transport air pollution and the potential costs of action that may

be premature. The study: 1) identifies the resources potentially at risk, as well as the societal concerns about the loss of these resources; and 2) identifies broad pollution control strategies, and discusses their costs, potential effectiveness, and societal effects. OTA discusses a range of plausible, regionally oriented impact scenarios which describe the potential environmental and social consequences of transported pollutants, and actions that might be taken to control them. These scenarios do not attempt to "forecast" the future, but instead present a range of plausible consequences of these changes, in terms responsive to near-term congressional decisions.

Report availability: Sprir.g 1984. Interim report, published July 1982. Call 226-2155 for further information.

Medical Technology and Costs of the Medicare Program

The costs of the Medicare program have been rising rapidly, and medical technology is a prime component of this increase. Of the $247 billion spent on national health expenditures in 1980, the Federal Government paid more than $70 billion, and of that amount nearly $37 billion was for Medicare. A substantial portion (perhaps as high as 50 percent) of increases in total health care costs has been attributed to an increase in the use of new and existing medical technologies.

Reimbursement policy has, in the view of many, led to rapid adoption and often excessive use of medical technologies. One approach to curtailing the growth of costs in the Medicare program is to change the ways in which medical technologies are added to Medicare coverage and the ways in which their use is paid for. For example, certain prospective reimbursement schemes (e.g., the use of diagnostic-related groups) or the encouragement of cost-reducing technologies have been suggested as ways to reduce Medicare costs. The project is analyzing a broad range of mechanisms to reduce or limit Medicare costs related to medical technology. In addition, it includes case studies of particular medical technologies. Four have been specifically requested: plasmapheresis, alcoholism treatment, variations in length of hospital stay, and continuous ambulatory peritoneal dialysis.

Report availability: Full report, summer 1984. Technical memorandum, *Diagnosis Related Groups (DRGs) and the Medicare Program: Implications for Medical Technology,* published July 1983. Case studies, *Health Technology Case Study 22: The Effectiveness and Costs of Alcoholism Treatment,* published March 1983; *Health Technology Case Study 23: The Safety, Efficacy, and Cost Effectiveness of Therapeutic Apheresis,* published July 1983; and *Health Technology Case Study 24: Variations in Hospital Length of Stay: Their Relationship to Health Outcomes,* published August 1983. Call 226-2070 for further information.

CURRENT PROJECTS

ENERGY, MATERIALS, AND INTERNATIONAL SECURITY

Technology and the American Economic Transition

New technologies, growing international competition in markets once dominated by U.S. suppliers, and dramatic changes in the cost and availability of oil and other critical resources may lead to a fundamental change in the structure of the U.S. economy. These changes could also change the utility of major classes of public policy. The analysis conducted for this project will describe ways the national economy may change during the next two decades, explore the ways these changes may alter prospects for employment and profitable investment in different major classes of economic activities, describe how the changes may alter critical aspects of the quality of life in America, and examine the implications of these changes for national policy.

The analysis will be constructed around seven tightly integrated projects. Five of these will be designed to explore plausible ways the economy may move to meet basic market requirements during the next two decades and the nature of the employment and investment opportunities created. The areas covered will include: the health industries, agriculture and food processing, construction, transportation and communication, education and "leisure-time" industries. At least two possibilities will be considered in each case: 1) an extrapolation of current trends; and 2) an analysis of ways the market *could* be met assuming that new technologies were introduced with no market "imperfections" except those explicitly introduced where markets clearly are inadequate (e.g., regulations designed to protect the environment). This analysis of "potentials" will not be a forecast in the conventional sense but will be designed to illuminate the range of possible impacts of new technologies. When the "potential" analysis differs significantly from projections based on trends, the work will provide a convenient basis for determining whether or not the divergence results from poorly designed Federal programs. A separate project will examine basic manufacturing and service industries not covered elsewhere. Each of these projects will result in a separate publication and an evaluation of specific policy problems identified in the sectors covered.

The components will be combined systematically using a simple accounting procedure developed for the project. Where relevant, the results will be compared with major macroeconomic models developed elsewhere. The integrated analysis will be used to examine major national policy issues affecting capital formation, employment, international competition, investments in infrastructure, R&D priorities, and other areas of major national interest.

Estimated publication date: Interim reports, early 1984 and summer 1984; final report, fall 1985. Call 226-3960 for further information.

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Load Management and Generating Technologies for Electric Utilities in the 1990's

Electric utilities are more constrained in their choice of generating technologies than they were a decade ago when they engaged in a massive construction program of large powerplants. In the early 1980's, with depleted financial reserves, and faced with uncertainties in electricity demand forecasts utilities are avoiding commitments to complex, long leadtime large powerplants. The Federal Government through a portion of its research and development funding, renewable tax credits and regulation encouraging the purchase of power from dispersed sources, has directly and indirectly encouraged the development of a series of new technologies that have in common the small size and short leadtimes which in theory offer greater flexibility to utilities. Such new technologies include: utility-controlled load management, fuel cells, advanced coal- and gas-combustion technologies, photovoltaics, solar thermal power, wind, and low-head hydro. The purpose of this assessment is to determine if utilities perceive these technologies as in fact being of likely practical significance in providing more flexible generating capacity. Do utilities anticipate problems in planning, constructing, maintaining, dispatching, and controlling these technologies that will hinder their use? Are these technologies likely to be adopted in significant numbers by nonutility-users which will then sell power to the grid?

Estimated publication date: Summer 1985. Call 226-2144 for further information.

Potential U.S. Natural Gas Availability

In the past few years there has been a change in the outlook about the potential for natural gas production in the lower 48 States. Recent optimistic projections by some groups have stimulated efforts to revise current natural gas policy so that natural gas can play a bigger role in reducing this country's oil imports. There remains, however, considerable uncertainty about how much the United States can rely on natural gas, which is tempering this optimism. This assessment is designed to help determine domestic (lower 48 States) onshore natural gas availability over the next few decades, and to help understand the factors that affect this availability. The OTA assessment will: 1) analyze the key technical and physical parameters that determine the resource base, production rates, and costs of all categories of below-ground natural gas; 2) critically review current estimates of the resource base, estimate the potential production rates of natural gas, and analyze the uncertainties in these estimates; and 3) assess future technology trends and R&D needs that may accelerate these trends.

Estimated publication date: Technical memorandum, *U.S. Natural Gas Availability: Conventional Gas Supply Through the Year 2000*, published September 1983; final report, fall 1984. Call 226-2152 for further information.

Strategic Responses to an Extended Oil Disruption

Over the next decade, there is a high probability that the Nation will experience a disruption in imported oil of a level that will exceed the capabilities of the Strategic Petroleum Reserve and seriously affect the economy.

This assessment will examine the opportunities and problems that characterize various technical responses that could supplement the Strategic Petroleum Reserve to meet such an interruption. The objective will be to determine what available resources might be expanded, the technical limitations for fuel substitution and switching, the physical constraints of stockpiling resources, and the impacts of accelerating the use of these technologies. Technologies to be considered will include enhanced oil recovery; adapting industrial boilers to dual-fuel capacity; biomass production; high-voltage transmission; hydro; wind; direct solar; vehicle retrofits; photovoltaics; retrofitting building envelopes and heating/cooling systems; retrofitting vehicles to improve mileage efficiency; and switching capacity of petroleum refineries. The study will be done at national and regional levels.

The assessment will be completed in two phases. Phase I will draw on OTA staff resources to collect data on the technical capabilities and constraints of the intervention technologies, and develop a summary document on potential of the technologies to alleviate the effects of various levels of oil disruption. In Phase II, OTA will examine the most promising technologies in greater detail, including complicated questions such as refinery-switching capacity, burner substitution logistics, electrical grid capacity and requirements.

Estimated publication date: Fall 1984. Call 226-2152 for further information.

Analysis of the Environmental Compatibility of the Federal Coal Leasing Program

The recent controversy over Federal coal leasing has focused on the fair market value of the leases and whether the leases will be developed in a manner compatible with current environmental laws and regulations. The principal concern is whether the tracts that have been leased or offered for lease over the past 2½ years, as well as those that will be considered for upcoming sales, have physical characteristics that would prevent them from being developed in compliance with the existing statutes, or have features not necessarily covered by these statutes that might cause environmental problems when the leases are developed. In addition, there are questions about the adequacy of the reviews carried out prior to sale by the Department of the Interior (DOI). Specifically, are the data and research on which their environmental reviews are based adequate? Do these reviews effectively account for cumulative impacts for coal development? This analysis will examine the

physical nature of the leased tracts to consider environmental problems that may arise when developed, and review the pre-sale analysis used by DOI to evaluate environmental impacts.

Estimated publication date: Spring 1984. Call 226-2144 for further information.

New Ballistic Missile Defense Technologies

The administration's "strategic defense initiative" (SDI) calls for a greatly accelerated program of research and development (R&D) of ballistic missile defense (BMD) systems, with the avowed goal of "eliminating the threat posed by nuclear ballistic missiles." The Defense Department has responded with a plan that would alter existing policies in three major ways:

1. it implicitly calls into question our commitment to the 1972 ABM Treaty, for although the President intends to keep R&D activities within the bounds set by the treaty, deployment of these systems would certainly require extensive modification of, or withdrawal from the treaty;
2. it shifts R&D emphasis from relatively conservative technologies to relatively high risk but potentially high payoff technologies including space-based directed energy weapons; and
3. it calls for a substantial increase in funding, especially in fiscal year 1986 and thereafter.

The first phase of OTA's study will be to develop criteria for assessing potential BMD systems and their components by identifying a range of possible objectives for a deployed system and translating these into performance requirements. Assessment criteria will also be developed for evaluating the effects of potential BMD systems on crisis and arms race stability, arms control, alliance relations, and foreign relations generally. The assessment will aim at identifying performance levels which can reasonably be expected in specified time frames, and assessing proposed technologies and systems on the basis of feasible rather than ideal levels of performance. It will also examine their likely cost and technical risk. The first phase will also include analysis of anti-satellite (ASAT) systems, since ASAT and BMD technologies are inherently related—advanced BMD systems would almost certainly have ASAT capabilities, and ASAT systems are among the critical possible countermeasures to a BMD system. The second phase will be a more detailed assessment of the specific technologies delineated in the Fletcher Committee report and will identify policy options.

Estimated publication date: Spring 1985. Call 226-2026 for further information.

Technology Transfer to the Middle East

During the last decade, the Middle East has been the world's fastest growing market, one which West European, Asian, and Communist as well as U.S. enterprises have all sought to penetrate. The oil-rich nations of the region

have the financial resources to purchase the most advanced equipment and technology, both civilian and military. Technology transfers on such a large scale may have important implications for both the recipient and supplier nations. However, there has been little systematic study of the extent or effectiveness of transfers of Western technology. This study will assess the commercial and strategic ramifications of transfers of advanced Western technologies (in sectors such as operation and maintenance of aircraft, petrochemical production facilities, nuclear powerplants, communications, and service systems) in order to provide a foundation for U.S. policy development.

The objectives of OTA's study are to assess past experience with technology transfers to the Middle East, to investigate the capability of these nations to effectively absorb advanced Western technology, to evaluate the likelihood of continued and expanding transfers in the years ahead, and to discuss the implications for American foreign and international economic policy.

The following questions will be addressed:

- How extensive have transfers of advanced Western technology to the Middle East been in recent years, what factors have determined which nations supply which technologies, and through what channels has transfer occurred? What have been the effects of these transfers?
- What factors inhibit or enhance the ability of Middle Eastern nations to absorb and master Western technology? Has it been the case that transfers in certain technology sectors have been particularly "successful," or that the experiences of various recipient nations differ significantly?
- In which sectors have American technology transfers been most extensive, and how competitive have U.S. firms been in Middle East markets?
- What opportunities and liabilities do advanced technology transfers portend for U.S. foreign and commercial policies in the decade ahead?

In some sectors, such as petrochemical production, technology transfers augur shifts in world markets, while in other sectors, such as medical services, they promise improvements in local living conditions. Nuclear technology transfers, in contrast, raise critical strategic questions. This study will outline U.S. policy options for affecting technology transfers in these areas.

Estimated publication date: Summer 1984. Call 226-2026 for further information.

International Cooperation and Competition in Civilian Space Activities

Over the next decade, the United States will face strong commercial competition from foreign space technology, and considerable interest from developing countries in cooperative ventures in space science and space applications technologies. This project will evaluate the current status of international competition and cooperation in key areas of space technology, in space

science, and for educational and scientific exchange. It will investigate ways in which space technologies and their products could be used as instruments of U.S. foreign policy, and examine military space activities insofar as they affect civilian programs and international commercial and political relations. The project will also assess the implications of various policies to enhance cooperation and/or competition with foreign entities. There will be two distinct but related parts, one assessing U.S. relations with industrialized countries, the other with developing countries. The former will emphasize French and Japanese space technology and the institutional mechanisms that have made them strong competitors with U.S. aerospace firms. The latter will focus on the uses of space technology in less developed countries, and evaluate the technical and economic issues that were evident in the United Nations Conference on the Peaceful Uses of Outer Space (UNISPACE '82).

Concern over the U.S. competitive stance vis-à-vis foreign space technology will be a part of the congressional agenda for the next several years, prompted by the development of the space shuttle and by concern over the U.S. position as an international leader in advanced technologies. Whether we are making the best use of space technology and space science as elements of our foreign policy, growing military space activities, and whether the United States is well enough prepared for international technical conferences such as UNISPACE '82 are also of concern to Congress.

Estimated publication date: Technical memorandum, *Unispace '82 A Context For International Cooperation And Competition*, published March 1983. Technical memorandum, *Remote Sensing and the Private Sector: Issues for Discussion*, March 1984. Full report, summer 1984. Call 226-2026 for further information.

Strategic Command, Control, Communications, and Intelligence Systems (C^3I)

U.S. strategic nuclear forces are intended to deter hostile Soviet actions, and to do so in a way that contributes to international stability. Their ability to meet these objectives depends not only on the character and capabilities of the weapons systems themselves, but also on the character and capability of the supporting C^3I systems. Specifically, both deterrence and stability may depend on: 1) the reliability with which a Soviet attack can be detected; 2) the timeliness and quality of the information about such an attack that can be assembled; 3) the speed and reliability with which this information can be communicated to the National Command Authorities; and 4) the immunity to disruption of communications between the National Command Authorities and the strategic forces.

The technical difficulty of making strategic weapons themselves survivable was a major focus of OTA's study of "MX Missile Basing." The problems of assuring the reliability and survivability of the systems that control these weapons are at least as difficult.

The purpose of the study is to assess the technical capabilities and vulnerabilities of present U.S. strategic C^3I systems. The study will identify needs and opportunities for improvement in the present systems, with special emphasis on additions to the systems that could usefully be made in the near term with available technology. Promising avenues of research for future improvements will also be identified.

Estimated publication date: Summer 1984 (Classified). Call 226-2026 for further information.

Technology and Structural Unemployment: Retraining Adult Displaced Workers

In an era of rapid technological and economic change, retraining of adult workers may become more important to combat worker displacement, to meet the needs of an aging work force, and to provide the U.S. economy with skilled workers. Displacement arises from permanent structural changes in American industry, and is a result of several factors, including new technologies in both existing and new industries, job losses in declining industries, import penetration, and domestic demographic changes. Displacement is expected by many observers to increase during the coming decade, despite economic recovery. Properly focused, retraining might help some displaced workers to find rewarding employment, even as the availability of skilled workers may help to remove one constraint to growth of competitive industries. The assessment will focus on technologies, policies, and methods of retraining displaced workers; and will examine the impact of retraining on structural unemployment and on the international competitiveness of U.S. industries.

The study will critically examine how estimates of displacement and structural unemployment are made, how uncertainties in the estimates could be reduced and what degree and type of uncertainties are unavoidable. The assessment will summarize the skills likely to be needed to perform the jobs of the future and examine the types of retraining that could match the existing skills of displaced workers with the skills demanded by jobs over the next 10 years. Retraining programs for displaced workers in other industrialized nations will be studied to see what features, if any, are applicable to the U.S. situation. The study will assess the extent to which retraining might assist displaced workers in finding employment and the extent to which retraining can be accomplished by the private sector without changes in existing public policies or legislation. Because the number of jobs created in the next decade may also be less than the number of people desiring jobs, other strategies than retraining may also be necessary to combat umemployment. The study will provide an overview of such strategies, and their possible impacts on the international competitiveness of U.S. industry.

Estimated publication date: Summer 1985. Call 226-2205 for further information.

Cleanup of Uncontrolled Hazardous Waste Sites Under Superfund

Mismanagement of hazardous wastes—both past and present—threatens human health and the environment and is expensive for our society. A start has been made in developing cleanup technologies for uncontrolled sites and in averting problems by effective management of new hazardous wastes. Nevertheless, existing technologies are inadequate for some cleanup goals; current economic commitments are dwarfed by the magnitude of the problem; more and more uncontrolled waste sites may need attention, perhaps even some already cleaned up; and institutional responses to known problems have often been called slow. Both the previous OTA study (Technologies and Management Strategies for Hazardous Waste Control) completed in March 1983, which was limited in the depth of its analysis of the as then still evolving Superfund program, and the OTA case study on Love Canal completed in June 1983 provide OTA with the experience to complete expeditiously the proposed detailed study of the Superfund program.

The objectives of this assessment are several fold:

- *Alternate Technologies:* to acquire a more comprehensive understanding of the capabilities and limitations of existing remedial technologies; to define R&D priorities for technologies to solve cleanup problems more cost effectively and permanently.
- *Site and Technology Selection:* to acquire a better understanding of the influence of EPA regulations and policies on: 1) the process of selecting sites and cleanup technologies from among alternatives; 2) the resulting protection of public health and environment; 3) technology and cost effectiveness; and 4) the development of innovative, new cleanup technologies.
- *Cleanup Goals:* to examine the issue "How clean is 'Superfund' clean?" and whether Federal criteria for cleanliness are needed to ensure that uncontrolled sites will be cleaned up to an acceptable standard, on a uniform basis, nationwide.
- *Active Sites:* to assess the effectiveness of detection and corrective actions required by the Resource Conservation and Recovery Act in the event of failure at active permitted sites, including hazardous waste landfills, municipal landfills and open dumps, injection wells, surface impoundments, and waste treatment plants.
- *Superfund Implementation:* to examine how effectively cleanups are designed and carried out by assessing the qualifications of EPA personnel, such as on-scene coordinators and contractors who carry out Superfund work, and the extent to which EPA and the States achieve effective coordination and cooperation in Superfund cleanup programs.

- *Economic Issues:* to examine: 1) the near- and long-term economic costs of an effective national cleanup program, 2) the implementation of the statutory "cost-effectiveness" and "cost-balancing" requirements, 3) the effects of not having standards for determining the extent of cleanup on costs and the use of federally supported relocation of residents, and 4) the practical problems of adopting a tax on wastes rather than the present one on oil and chemical feedstocks for financing the Superfund program.

Estimated publication date: Winter 1985. Call 226-2089 for further information.

Technologies To Reduce U.S. Materials Import Vulnerability

The United States currently imports over one-half of its consumption of each of a number of commonly used materials. Included among those imported are several considered to be vital for national defense (strategic) and important to the U.S. industrial economy (critical). Several of the most important defense-related materials have only a small number of supplier countries and these are largely southern African nations, other developing countries, and the U.S.S.R. Raw material supplies are not the only strategic concern. For example, because of the changing world economy, the United States has lost a considerable portion of its capacity to produce ferromanganese and ferrochrome to foreign competition.

The focus of the study will be on technical opportunities to reduce our vulnerability to interruptions in supply of strategic and critical imported materials in the longer term (5 to 25 years) through, for example, substitution, including materials, process and product substitution, improved mining, processing and recycling technologies, and more efficient fabrication and design.

The study will also identify major changes in materials vulnerability that are likely to occur over the next 25 years because of advances in such fields as electronics, energy, and transportation.

Estimated publication date: Summer 1984. Call 226-2269 for further information.

HEALTH AND LIFE SCIENCES

Reproductive Hazards in the Workplace

Today there are nearly 60,000 chemicals in commercial use in the United States, with an additional 700 to 1,000 introduced into the marketplace each year. The production of synthetic chemicals is increasing faster than our knowledge of the relationship between chemical exposures and chemically induced diseases such as cancer and birth defects. Concern over reproductive hazards in the workplace is increasing not only because more chemicals are being produced that can affect the reproductive capacity of men and women, but also because more women are entering the workplace. By 1982, there were 48 million women workers; the projected number is 57 million by 1990.

The reproductive hazards of some agents found in the workplace are well known. These include dibromochloropropane (DBCP), anesthetic gases, and lead. However, the effects of many chemicals are only partially understood from animal studies and many remain to be tested.

The available data on the level of reproductive impairment are difficult to interpret. For example, it is difficult to measure the prevalence of birth defects because of differences in definition and to measure the incidence of spontaneous abortions because of difficulty in ascertainment. However, there is some evidence that the level of reproductive impairment is increasing, and that this may be due, in part, to workplace exposure to harmful substances.

A major issue in reproductive hazards in the workplace is the differential treatment accorded males and females. Males, females, and the developing fetus have specific rights and different susceptibilities. How to treat female workers has an added dimension because the fetus is biologically dependent on the female.

Through legislation, both research and regulatory agencies have been established to ascertain the level of potential hazards, evaluate scientific evidence, and set standards for permissible exposure levels. One important question is the relationship of the standard-setting process to the level of scientific knowledge. Another important issue is the relationship between these two and recent and past litigation.

This assessment will evaluate the current scientific knowledge base with respect to reproductive hazards. Policy options for reproductive hazards in the workplace will be outlined and discussed.

Estimated publication date: Summer 1985. Call 226-2090 for further information

Alternatives to Animal Use in Testing and Experimentation

Approximately 70 million animals are used annually for both toxicity testing and biomedical and behavioral research. In a large percentage of cases, these animals are killed during the course of, or following the completion of, the experimental protocol. Toxicity testing and biomedical and behavioral research are two very distinct disciplines, and animal use and its possible alternatives must be examined in light of their differences.

This assessment will examine the current patterns of acquisition and use of animals in the distinctly different disciplines of toxicity testing and biomedical and behavioral research. In addition, the feasibility and cost of developing technologies that could potentially substitute for animals in either of these areas will be evaluated. Since toxicity testing employs about 20 percent of all laboratory animals used annually, OTA will also analyze regulatory testing requirements in both the United States and selected foreign countries to determine whether they can be made more uniform in their acceptance of non-animal test results.

Finally, this study will briefly summarize the ethical issues concerning animal use in order to help understand the reasons for the current controversy.

Estimated publication date: Summer 1985. Call 226-2090 for further information.

Technology and Aging in America

The aging of the American population raises critical concerns for employment, the retirement system, transportation, health care, recreation, and housing. The large increase in numbers of the 65-year and older age group has occurred because of technological advances that have resulted in better control of infectious and chronic diseases and improved standards of living. New technologies under development today suggest continued change in longevity and functional capacity.

Most current projections of the impact of our aging population assume an elderly population with characteristics similar to that population today—withdrawal from the work force, declining health, increased needs for hospitalization and nursing care, and other characteristics that suggest a highly dependent 65-year and older age group. However, improved health care, increased understanding of the physiology of aging, and other advances in technology may alter the characteristics of the elderly of the future. In addition, applications of computers, robotics, telecommunications, and other technical innovations in the home and workplace may provide new opportunities for increasing the independence, productivity, and quality of life for this segment of our population.

Four areas where the impact of technology will be assessed are health and life sciences, employment, housing and public services, and international aspects (examples of responses to elderly populations in other industrialized countries).

Estimated publication date: Summer 1984. Call 226-2090 for further information.

Technology, Public Policy, and the Changing Structure of American Agriculture

During the past three decades technological change and innovation in biological systems, labor-saving mechanization, transportation, and agricultural chemicals have played an important role in increasing agricultural productivity. It has also contributed to changing the very nature of agriculture. Today, farm operators account for only 3 percent of the U.S. population. Twenty percent of all farms now produce 80 percent of the food and fiber in the United States. Increased capital and kinds of skill are needed to sustain farms. Such changes have important implications for society.

Technology is only partly responsible for these changes. Public policy has also played a role. However, little is known about which policies in conjunction with technology adoption have speeded up, slowed down, or reversed the trends in structural change.

This assessment will focus on future and emerging technologies in the animal, plant, chemical, mechanization, and information areas and their implications for agricultural structure. The possibility of developing technologies for different kinds of agriculture structures will be explored. The assessment will explore links between policy and structure so policymakers can have a clearer understanding of the factors that influence the evolution of the agricultural sector.

Estimated publication date: Spring 1985. Call 226-2266 for further information.

Medical Technology and Diagnosis Related Groups: Evaluating Medicare's Prospective Payment System

In order to control the rapidly rising costs of the Medicare Program, the Social Security Amendments of 1983 mandated a new Medicare hospital payment system: prospective payment based on Diagnosis Related Groups (DRGs). The new system is radically different from previous ones. Plans must be made for a comprehensive evaluation of its effects, and assumptions about its implications must be explicitly tested. One of the key areas of impact will

be on the development and use of medical technology. The OTA study will not be the evaluation itself; rather, it is to be a complete layout of the critical, medical technology related issues that need addressing. It will:

- identify the range of possible effects related to medical technology and its use;
- identify evaluation measures;
- identify ongoing or planned monitoring and evaluation activities;
- identify shortcomings and gaps in these activities; and
- develop an overall design for evaluation, including timing, methodology, priorities, and the role of current or planned efforts.

Estimated publication date: Summer 1985. Call 226-2070 for further information.

Status of Biomedical Research and Related Technology for Tropical Diseases

The human and financial effects of tropical diseases are enormous. Worldwide, hundreds of millions of people suffer from the various tropical diseases (e.g., malaria, trypanosomiasis, schistosomiasis, leprosy), with devastating implications for tropical countries' economies and standards of living. Because of the potential impact of technological advances in the area of tropical diseases and the historically modest levels of research and development funding in that area, it is important to examine whether Federal funds are being appropriated in a manner reflective of scientific opportunities and of the current burden posed by such diseases.

This assessment will examine the status of biomedical and epidemiological research and related technology development in the area of tropical diseases. It will analyze data on the diseases' prevalence, on the burden posed by them, and on sources and levels (both U.S. and foreign) of research funding. The assessment will define research priorities: It will examine the status of research and technology in the major disease areas, identify areas of promise for continued or increased funding, and present a series of options for making decisions about research funding, technology development and testing, and other policies regarding tropical diseases. In addition, the assessment will develop specific information on the Gorgas Memorial Institute of Tropical Medicine and its research areas and accomplishments.

Estimated publication date: Technical memorandum, *Quality and Relevance of Research and Related Activities at the Gorgas Memorial Laboratory,* published August 1983; final report, summer 1984. Call 226-2070 for further information.

Blood Policy and Technology

Over the past decade, there have been major changes in the technologies for dealing with blood collection and distribution and for monitoring the quality of blood products. Research on blood and its components promises to lead to further changes. The supply system, however, remains dependent on human sources, and voluntary donations, rather than paying for blood, have been encouraged. Today, less than 5 percent of all whole blood collected in the United States is bought. However, use of blood components instead of whole blood has increased significantly. Commercial plasma collection centers account for about 70 percent of U.S. plasma production, and the United States is a major exporter of plasma and its components. For example, almost all antihemophilic factor (AHF) is derived from paid plasma donations, and almost all of the 688 million units of AHF used worldwide in 1979 was prepared in the United States.

A new disease, acquired immune deficiency syndrome (AIDS), has recently been linked to blood products. It may have significant impacts on the blood donor system: 1) What technologies are available to screen donors without discouraging donations? and 2) What technologies can be used to protect those receiving blood from the disease?

The project would assess technologies affecting the availability, uses, and risks of blood. Promising new technologies would be assessed in the areas of: 1) blood collection, processing, storage, and distribution; 2) identification, isolation, production, and use of blood components; 3) blood substitutes; and 4) identification and prevention of blood-transmitted diseases and other risks.

Estimated publication date: Interim report, late 1983; final report, fall 1984. Call 226-2070 for further information.

Federal Policies and the Medical Devices Industry

During the past two decades, technologies such as automated blood chemistry analyzers, ultrasound imaging, and cardiac pacemakers have become common elements of medical diagnosis and therapy. The growth of the industry that manufactures such technologies has paralleled the growth of expenditures for medical care. The industry's sales totaled an estimated $13 billion in 1981, more than three times the 1972 level and 11 times the amount in 1958.

Congress is continually called on to develop policies that will affect the medical devices industry, but in the past has lacked adequately analyzed information to appropriately deal with the subject. Federal policies related to the research, marketing, location, and financing (medical insurance) of medical

technologies, as well as to the taxation, patenting, and foreign trade of all technologies, affect the development, manufacture, and sale of medical devices.

This assessment will eliminate some of the gaps in basic information about the medical devices industry and analyze the implications of alternative Federal policies. The assessment will develop information about the nature of firms that manufacture medical technologies, conduct case studies of selected medical devices, and examine present and proposed Federal policies that influence the medical devices industry and in turn the cost and effectiveness of medical devices.

Estimated publication date: Summer 1984. Call 226-2070 for further information.

Evaluation of Agent Orange Protocol

The epidemiologic study by the Veterans Administration of the long-term health effects resulting from exposure to Agent Orange was mandated in the Veterans Health Programs Extension and Improvements Act of 1979 (Public Law 96-151). The same law requires OTA to review the study design and monitor the conduct of the study. An advisory panel was assembled to carry out the review. The study design was tentatively approved in March of 1982. The Centers for Disease Control will carry out the study. OTA will continue to monitor the study and its progress.

Estimated publication date: Indeterminate. Call 226-2070 for further information.

Health and Safety Control Technologies in the Workplace

One hundred million Americans work. Each year there are some 2.3 million disabling injuries and 13,200 accidental deaths in the workplace, and perhaps 100,000 people die from job-related diseases. Efforts to reduce this toll involve employers, labor organizations, nonprofit institutions, insurance companies, and Government agencies. To a major extent these efforts are directed at developing and applying control technologies—engineering controls, worker education programs, and personal protection devices.

New industrial plant construction and modernization of existing plants is expected to result from interest in increased productivity and reduced energy consumption. Such construction may offer opportunities for installing new technologies to reduce workplace health and safety hazards.

This assessment will develop information about research and development, diffusion, application, and evaluation of workplace control technologies. Engineering controls, worker education programs, personal devices, and interrelationships between them will be described and their role in worker protection evaluated.

One product of the assessment will be a series of options. These are expected to address:

- improving data about workplace accidents and illnesses;
- aiding development of appropriate technologies, their diffusion, application, and evaluation; and
- making control technologies available to small firms at a price they can afford.

Estimated publication date: Summer 1984. Call 226-2070 for further information.

SCIENCE, INFORMATION, AND NATURAL RESOURCES

Intellectual Property Rights in an Age of Electronics and Information

This assessment will identify and analyze trends in the development of the new information technologies to determine those areas where there might be gaps in the laws and practices of intellectual property; it will examine how their widespread deployment and use might alter the value of information and thus affect the future creation, production, distribution, use of, and access to information and knowledge-based products; and it will identify and evaluate policy strategies—legal, technological, economic, and social—for addressing intellectual property issues in an age of electronics.

Examples of some of the issue areas that may be included for analysis are:

- the legal and institutional issues resulting from rapid technological change,
- the technological issues that result from the impact that intellectual property law might have on technology,
- sociopolitical issues arising from the public/private aspects of information,
- the economic issues arising from the enhanced value of information and information services,
- the international issues resulting from the increased flow and value of information across national boundaries, and
- the ethical issues arising from the conflict between public laws and private practices.

Estimated publication date: Winter 1985. Call 226-2240 for further information.

Federal Government Information Technology: Administrative Process and Civil Liberties

The U.S. Government, already a major user of computerized information systems and other information technology, is at the threshold of a major transition to the next generation of this technology. For example, the number of Federal computer systems is expected to increase from about 18,000 in 1983 to between 300,000 and 1 million in 1990. Current Government use of these technologies has already generated questions about their impacts on Government; the dramatically increased future use will further affect Government administration, provision of public information, civil liberties, and the balance of power among branches and levels of government.

This study will evaluate computer and communication technologies relevant to Government information systems, profile current and evolving Federal systems, and assess the impacts and policy implications of such systems in key areas of concern to Congress. The study will determine, to the extent possible, where and how computerized systems are fundamentally changing the administrative process and/or outstripping the existing framework of legal and procedural safeguards to civil liberties and mechanisms for congressional and judicial oversight.

Estimated publication date: Winter 1985. Call 226-2240 for further information.

Information and Communication Technologies and the Office

Increasing use of word processing systems, desktop computers, optical disks, telecommunications, and other forms of office automation is likely to significantly affect public and private sector office environments. The appeal of these advanced office technologies derives from their capability to increase office productivity. The most significant trends over the long term appear to be the integration of automated equipment and systems within the office, through local area networks, and the transmission of information generated and/or manipulated within these networks across long distances by means of enhanced communication services.

Widespread utilization and integration of information and communication technologies are likely to change the organization of the office, the structure of office occupations (and their inherent skill levels), the location of work, and the numbers of individuals employed. This raises issues of interest to Federal policymakers concerned with U.S. economic conditions, research and development, industrial policy, telecommunications policy, employment, education and training, Federal procurement and management, and privacy and security of information.

The major objectives of this assessment are the following:

- identify plausible trends in office automation over the next decade, including the state of research and development, and assess the technology issues, including standards;
- assess economic impacts of further development of industries that produce and use automated office systems and services;
- assess the impacts on employment such as changing skill requirements, displacement, and working environment, including impacts on the Federal work force;
- identify possible changes in education, training, and retraining requirements—both short term and long range;
- assess the legal, security, and privacy implications of the use of electronic information in the office;

- assess the effects of office automation applications on local, national, and international telecommunications services and data transmission; and
- analyze the effects of Federal policy options on the further development and use of office technologies in the public and private sectors.

Estimated publication date: Summer 1985. Call 226-2250 for further information.

Information Technology Research and Development

Computer and communications technologies are vital components of the domestic economy. In 1981, computers and business machines alone provided a $6.9 billion surplus to the U.S. balance of trade. Computer and communications also form the information services network that supports and enhances productivity in every other sector of the economy. In addition, they are indispensable components of our national security system.

Underlying current U.S. leadership in information technology has been a strong national research and development effort led in communications by the industrial sector, and in computers by both industry and government. Those traditional patterns of research and development are likely to alter significantly due to shifts in industry structure, Federal science and technology policy, international competition, and technological advances that are now taking place. These changes will affect who will do research, what areas are chosen, levels of support, and the balance between long-term exploratory research and short-term development. They will be strongly influenced by Federal policy, both directly by trends in R&D support and indirectly by tax, antitrust, regulatory, copyright, and education policy.

OTA will characterize those shifts in R&D, project their implications for U.S. leadership in computer and communication technology, and analyze the potential influences of Federal policy on the directions and levels of R&D support.

Estimated publication date: Summer 1984. Call 226-2240 for further information.

Effects of Information Technology on Financial Services Systems

The use of new telecommunication and computer technologies in the financial industry is changing both the character of the industry and the relationships between it and its customers. The technology allows financial institutions to alter and diversify the services offered, to distribute them more broadly, and to link them together into national and worldwide networks. Technology also enables firms that have not previously offered financial services to enter the market—firms often unconstrained by the regulatory structure under which

traditional providers of financial services have operated. Future technological developments may offer additional possibilities for the development of innovative financial services for both individual consumers and businesses. Thus, technological imperatives could significantly change the structure of the financial services industry, an area of economic activity that has long been of interest to Congress.

This study will examine: 1) technologies that are likely to be employed in delivering financial services in the future; 2) the nature of the services that may be provided; and 3) alternative structures of the financial services industry that may emerge as a result of applying new and existing technologies, particularly as they interact with Federal policy.

Estimated publication date: Summer 1984. Call 226-2036 for further information.

Technology for Developing Offshore Oil and Gas Resources in Hostile Environments

Most of the U.S. offshore oil and gas resources are expected to be found in: 1) Alaska, and 2) deepwater of the continental shelf and in the Gulf of Mexico Oceanic Basin. Up to one-half of the undiscovered recoverable hydrocarbons are expected to lie in deepwater between 668 to 12,888 feet. Operating in arctic and sub-arctic regions requires technologies to withstand ice conditions and high winds and waves. As the petroleum industry moves into hostile environments, questions arise regarding the adequacy of Federal procedures to deal with oil and gas development. These questions include:

1. Are procedures adequate for encouraging high-risk development by the industry?
2. Can environmental and personnel safety be ensured?
3. Is there sufficient information on resource and engineering factors, ice movement, and wave and wind conditions to safely administer Federal offshore leasing?
4. Are there technological factors that may affect the pace of offshore leasing?
5. Are there economic factors that will affect the rate of resource development? and
6. Are changes needed in the statutes and regulations to encourage industry's development of offshore resources and protect the environment?

Estimated publication date: Summer 1985. Call 226-2077 for further information.

Technologies To Measure, Monitor, and Mitigate Groundwater Contamination

Groundwater resources presently supply about 25 percent of all freshwater requirements in the United States, including about 50 percent of domestic drinking water needs. At the same time, the Nation is increasing its use of

the subsurface for waste disposal and other nonwaste-related purposes that are threatening the quality of the groundwater resource. Groundwater contamination that can be attributed to human activity is being detected nationwide and with increasing frequency, and it can have serious and long-lasting impacts on human health, the environment, and local and regional economies.

Because the conditions that have been identified as giving rise to groundwater contamination are so pervasive, there is a growing national concern about the amount of contamination that has yet to be detected and the vulnerability of this national resource to still further degradation. This study provides a comprehensive technical framework to assist Congress in understanding and addressing the major groundwater contamination issues facing the Nation. Issues examined include the nature and extent of groundwater contamination, present efforts and capabilities to deal with groundwater contamination problems, and prospects for protecting groundwater quality. Key Federal policy options also are addressed.

Estimated publication date: Summer 1984. Call 226-2004 for further information.

Technology, Innovation, and Regional Economic Development

In the last 10 to 20 years, several regions of the United States have developed strong local economies based on fast-growing "high-technology" firms engaged in the systematic development and commercialization of new products, processess, and services. These firms and the industries they compose are an important factor in U.S. international competitiveness and a major source of new manufacturing jobs. Several Federal policies are aimed at encouraging their growth. Many State and local development programs are also based in part on strategies for attracting or stimulating the formation of small high-technology companies.

Congressional concern for the role of industrial innovation in a well-balanced program for national economic development and revitalization is demonstrated in recently enacted legislation, including the Stevenson-Wydler Technology Innovation Act of 1980, the Small Business Innovation Development Act of 1982, and the research- and investment-related provisions of both the Revenue Act of 1978 and the Economic Recovery Tax Act of 1981. Legislation now pending and likely to be reintroduced in Congress addresses related policy issues, including Federal R&D policy, capital formation, export competitiveness, manpower training, community development, and the needs for technical assistance and financing mechanisms at the State and local levels.

The assessment will determine where high-technology firms are appearing and what factors influence their distribution and growth; identify and

evaluate the effectiveness of State and local initiatives to encourage innovation and high-technology development; and address the appropriate Federal role in affecting the conditions for such growth in the future.

Estimated publication date: Full report, summer 1984. Background papers: *Census of State Government Initiatives for High-Technology Industrial Development*, published May 1983; *Encouraging High-Technology Development*, February 1984. Call 226-2214 for further information.

Civilian Space Stations

Over the past quarter century, the United States has continued to increase its capabilities for operating in space. With the end of the large Space Shuttle development program in sight, 2 years ago the National Aeronautics and Space Administration (NASA) formed a task force to begin planning activities for the acquisition of long-term in-orbit infrastructure. The President has now directed NASA to develop the first elements of such infrastructure over the next decade in a "space station" program. NASA expects that the initial elements it now favors would cost $8 billion. The complete array of elements is expected to cost at least $20 billion by the end of the century.

OTA will examine questions such as the following: What are the leading alternatives for meeting foreseeable national needs for in-orbit infrastructure? How may the private sector be more fully involved in constructing, operating, and using the elements of this infrastructure? What are the prospects for important international collaboration in a space infrastructure program? What are the goals and objectives of the Nation's publicly funded space activities, and how would the character and cost of infrastructure relate to them?

Estimated publication date: Technical memorandum, *Salyut: Soviet Steps Toward Permanent Human Presence in Space*, published December 1983; Full report, spring 1984. Call 226-2214 for further information.

Airport System Development

The National Airspace System Plan issued by the Federal Aviation Administration (FAA) in January 1982 states that "airport capacity limitations at busy airports will be the constraining element in the National Airspace System." FAA anticipates that few, if any, new air carrier airports will be built in the next 20 years and that capacity expansion of existing airports will be severely limited by the availability and cost of land, concern about the environment and airport noise, and constraints on airport access. OTA will assess the technologies to be applied to increase capacity or improve service at airports and the mechanisms by which the technology can be deployed and brought to bear on the problems of civil aviation.

Estimated publication date: Summer 1984. Call 226-2177 for further information.

SELECTED PUBLICATIONS OF INTEREST

ENERGY, MATERIALS, AND INTERNATIONAL SECURITY DIVISION

***Nuclear Power in an Age of Uncertainty**—Examines the future of nuclear power and describes the current technological, economic, financial, public perception, and regulatory problems facing the domestic industry.

***Industrial and Commercial Cogeneration**—Examines the technical features of commercial and advanced cogeneration technologies, including requirements for connecting cogenerations to the utility grid and technologies for storing thermal or electrical energy.

***Industrial Energy Use**—Examines four American industries (pulp and paper, steel, petroleum refining, and organic chemical production).

***Increased Automobile Fuel Efficiency and Synthetic Fuels: Alternatives for Reducing Oil Imports**—Assesses increased automobile fuel efficiency and synthetic fuels production with respect to their potential to reduce conventional oil consumption, and their costs and impacts.

***Energy Efficiency of Buildings in Cities**—Focuses on the interaction of technology and policy for new and existing buildings in U.S. cities for the next two decades.

***Solar Power Satellite Systems**—Assesses the potential advantages, shortcomings, and impacts of solar satellite systems.

Nuclear Powerplant Standardization—Provides the essential background material for a broad understanding of the nuclear industry, its institutions and their relationship to standardization.

The Future of Liquefied Natural Gas Imports—Evaluates projected U.S. demand, global availability, cost and financing, and security of foreign supplies.

***Energy From Biological Processes**—Evaluates the energy potential of plant and animal matter.

Conservation and Solar Energy Programs of the Department of Energy—Analyzes the progress and direction of five major conservation and solar energy programs of the U.S. Department of Energy.

Residential Energy Conservation—Examines the prospects of existing and new technologies for reducing energy consumption in homes.

The Direct Use of Coal: Prospects and Problems of Production and Combustion—Assesses the prospects as well as the environmental, health, safety, and other problems of mining and burning significantly more coal than at present.

Application of Solar Technology to Today's Energy Needs—Evaluates the economic, technical, and environmental impacts of solar energy systems located at the point of use.

***A Technology Assessment of Coal Slurry Pipelines**—Compares the cost of transporting coal by slurry pipelines to rail for certain routes.

***International Competitiveness in Electronics**—Examines those factors contributing to the competitiveness of the electronics industry that could most readily be affected by U.S. Government policy.

***Technology and Soviet Energy Availability**—Analyzes and identifies various levels of availability of U.S. and other Western energy technology and examines the impact on Soviet energy production to 1990.

***MX Missile Basing**—Assesses the technical feasibility, strategic utility, cost, impact on the region, and future consequences of various MX-basing modes.

***U.S. Industrial Competitiveness: A Comparison of Steel, Electronics, and Automobiles**—Extends OTA's efforts in the study of industrial competitiveness to a cross-industry comparison.

***Taggants in Explosives**—Assesses the technical feasibility, safety ramifications, costs, and law enforcement utility of a proposal to require that commercial explosives be manufactured with "identification and detection taggants."

Technology and East-West Trade—Examines the economic, military, and political implications of technology transfer to the Communist world.

***The Effects of Nuclear War**—Examines the social, economic, political, and health effects of various levels of nuclear attacks on the United States and the Soviet Union.

Remote Sensing and the Private Sector—Issues for Discussion: A Technical Memorandum—Focuses on the appropriate requirements and conditions needed for private sector ownership of the U.S. land remote-sensing system.

***Wood Use: U.S. Competitiveness and Technology**—Surveys forest products industry, domestic demand, and world markets.

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*Summary available.

*__Technologies and Management Strategies for Hazardous Waste Control__—Assesses the criteria for defining hazardous waste and for judging the relative health and environmental hazards of a given waste.

*__An Assessment of Development and Production Potential of Federal Coal Leases__—Analyzes all mining activities, examines present and potential development value, estimates revenues to the Federal Government and deep-mining feasibility on Federal leases.

*__Technology and Steel Industry Competitiveness__—Assesses how and when new technology can improve the international competitiveness of the U.S. steel industry.

*__An Assessment of Oil Shale Technologies__—Assesses the status and potential of technologies for the development of oil shale resources.

__Technical Options for Conservation of Metals: Case Studies of Selected Metals and Products__—Explores the kinds and amounts of waste that occur in our use of eight critical metals.

__Materials and Energy From Municipal Waste: Resource Recovery and Recycling From Municipal Solid Waste and Beverage Container Deposit Legislation__—Examines present and potential technologies for producing energy and recovering resources from municipal solid waste.

__Management of Fuel and Nonfuel Minerals in Federal Land__—Analyzes Federal laws and practices that govern the exploration, development, and production of fuel and nonfuel minerals in onshore Federal Lands.

__Analysis of Laws Governing Access Across Federal Lands: Options for Access in Alaska__—Analyzes laws, regulations, and policies affecting access across federally owned lands to minerals on non-Federal lands.

__Nonnuclear Industrial Waste: Classifying for Hazard Management: A Technical Memorandum__—Reviews the nature and magnitude of hazardous waste disposal.

__World Petroleum Availability: A Technical Memorandum__—Examines prospects for world oil supplies and production during the next two decades.

__Gasohol: A Technical Memorandum__—Discusses the technology and economics of gasohol production.

HEALTH AND LIFE SCIENCES DIVISION

*__Commercial Biotechnology: An International Analysis__—Describes the state of the art of biotechnology as applied to industries involved in agriculture, pharmaceuticals, and chemicals.

*__The Role of Genetic Testing in the Prevention of Occupational Disease__—Examines questions on the technological state of the art.

*__Impacts of Applied Genetics: Micro-Organisms, Plants, and Animals__—Examines the application of classical and molecular genetic technologies to micro-organisms, plants, and animals.

*__World Population and Fertility Planning Technologies: The Next 20 Years__—Examines how Government policies and programs view planned birth technologies, and how new international population assistance has changed world population growth in the last 20 years.

*__Technologies to Sustain Tropical Forest Resources__—Examines the importance of tropical forests to the United States and the world.

*__Water-Related Technologies for Sustainable Agriculture in U.S. Arid and Semiarid Lands__—Focuses on U.S. and foreign experience.

__Plants: The Potentials for Extracting Protein, Medicines, and Other Useful Chemicals__—Identifies technological opportunities and constraints for commercially developing protein, pharmaceuticals, chemicals, and other associated extracts from plants.

*__Impacts of Technology on U.S. Cropland and Rangeland Productivity__—Examines the effects of presently used technologies on the capacity of cropland and rangeland resource base to sustain high levels of production.

*__U.S. Food and Agricultural Research__—Analyzes the scientific base for establishing national, regional, and local research problems and the role of Federal, State, and private institutions in solving these problems.

__Environmental Contaminants in Food__—Discusses the different types and sources of chemical and radioactive contaminants in food.

*__Pest Management Strategies in Crop Protection__—Reviews the array of tactics currently used to control agricultural pests.

__Open Shelf-Life Dating of Food__—Addresses the practicality, benefits, and costs of open shelf-life dating of food products.

__Drugs in Livestock Feed__—Analyzes the use of antibacterial and other drugs to promote growth and prevent disease in livestock.

__Nutrition Research Alternatives__—Evaluates alternative strategies to redirect Federal research toward examining the relationship between nutrition and the changing health problems of Americans.

__Organizing and Financing Basic Research To Increase Food Production__—Evaluates alternative methods for organizing and funding basic research in the biological sciences.

*Summary available.

Perspectives on Federal Retail Food Grading—Assesses the capability of the current food grading system used by the Federal Government.

Postmarketing Surveillance of Prescription Drugs—Describes the drug approval process, the history and objectives of postmarketing surveillance, the methods employed to accomplish it, and current activities in postmarketing surveillance.

***Medical Technology Under Proposals To Increase Competition in Health Care**—Analyzes the implications for medical technology of two categories of proposals to increase competition.

MEDLARS and Health Information Policy—Analyzes the arguments for and against the National Library of Medicine's creation and dissemination of health-related bibliographic information.

***Strategies for Medical Technology Assessment**—Examines the appropriateness and validity of existing assessment methods, such as controlled clinical trials, epidemiological studies, and consensus exercises.

***Technology and Handicapped People**—Provides information on general issues, such as the state of the art of evaluating efficacy, safety, and cost.

Cost-Effectiveness Analysis of Inactivated Influenza Vaccine—Examines the cost effectiveness of influenza vaccine.

***Assessment of Technologies for Determining Cancer Risks From the Environment**—Examines four major issues: estimates of the percentage of cancer due to environmental exposure, technologies used to test for carcinogenicity, methods used for extrapolating data from animals to humans, and regulatory pathways for controlling carcinogens.

The Implications of Cost-Effectiveness Analysis of Medical Technology—Analyzes the feasibility, implications, and usefulness of cost-effectiveness analysis and cost-benefit analysis in health care decisionmaking.

Forecasts of Physician Supply and Requirements—Analyzes the assumptions, methods, and conclusions of the technologies for forecasting both the need for and supply of physicians by specialty and geographical distribution.

A Review of Selected Federal Vaccine and Immunization Policies Based on Case Studies of Pneumococcal Vaccine—Analyzes Federal policies related to four areas of vaccine and immunization activities.

Selected Topics in Federal Health Statistics—Examines data systems used in Federal health programs and offers alternatives for their effective management.

Assessing the Efficacy and Safety of Medical Technologies—Evaluates the need for assessments of the efficacy and safety of medical technologies before they go into widespread use.

Policy Implications of the Computed Tomography (CT) Scanner—Analyzes issues such as efficacy, health planning, use, and financing arising from the widespread adoption of the CT scanner.

Policy Implications of Medical Information Systems—Examines the potential of computer-based medical information systems.

Cancer Testing Technology and Saccharin—Assesses the capacity of current testing methodology to predict the carcinogenic potential of chemicals consumed by humans.

Development of Medical Technology: Opportunities for Assessment—Examines the need for assessing the potential social impacts of emerging medical technologies while they are being developed.

Quality and Relevance of Research and Related Activities at the Gorgas Memorial Laboratory: A Technical Memorandum—Reviews the quality and relevance of activities at the Gorgas Memorial Laboratory.

Technology Transfer at the National Institutes of Health: A Technical Memorandum—Presents general information on biomedical R&D and its relationship to technology transfer, and on the processes of transferring medical technology and of assessing that technology.

Compensation for Vaccine-Related Injuries: A Technical Memorandum—Reviews the pros and cons of establishing a Federal vaccine injury compensation program.

SCIENCE, INFORMATION, AND NATURAL RESOURCES DIVISION

***Informational Technology and Its Impact on American Education**—Identifies and projects relevant technology and R&D activity, and the providers and uses of curricula, and educational technology.

***Radiofrequency Use and Management: Impacts From the World Administrative Radio Conference of 1979**—Reviews the U.S. preparations for and participation in WARC-79, identifies its major results and projects their impacts.

Computer-Based National Information Systems: Technology and Public Policy Issues—Summarizes and analyzes three U.S. information systems: National Crime Information Center of the FBI, electronic message systems, and electronic funds transfer.

***Alternatives for a National Computerized Criminal History System**—Assesses the use and operation of computerized criminal history systems by Federal law enforcement agencies.

*Summary available.

*__Implications of Electronic Mail and Message Systems for the U.S. Postal Service__—Evaluates the impact of electronic message systems (EMS) on operations of the U.S. Postal Service and assesses alternative roles for the Postal Service in provision of EMS and services.

__Patent-Term Extension and the Pharmaceutical Industry__—Examines the benefits and efficacy of pharmaceutical innovation and research and development.

*__Wetlands: Their Use and Regulation__—Presents the findings and conclusions of OTA's analysis of approaches to wetlands use.

*__An Assessment of Maritime Trade and Technology__—Traces prevailing conditions and dominant trends that are important to the way the Government assumes its responsibility in developing and implementing policy.

*__Use of Models for Water Resources Management, Planning, and Policy__—Evaluates methodologies, findings, and implications of Global 2000 and other global modeling studies.

*__Technology and Oceanography: An Assessment of Federal Technologies for Oceanographic Research and Monitoring__—Identifies the technologies and management systems that are most effective in researching four areas: weather and climate, marine pollution, undersea mineral exploration, and fisheries.

__Transportation of Liquefied Natural Gas__—Evaluates the status and trends of ongoing and proposed projects involving the transportation and handling of liquefied natural gas.

__Establishing a 200-Mile Fisheries Zone__—Evaluates the problems and opportunities presented by the new 200-mile U.S. fishery zone.

__Coastal Effects of Offshore Energy Systems__—Assesses social, economic, and environmental impacts of three proposed offshore energy systems.

__Review of FAA National Airspace System Plan__—Critiques the FAA National Airspace System Plan.

__Civilian Space Policy and Applications__—Explores Federal involvement in space R&D, when and under what circumstances commercial involvement is appropriate.

*__Global Models, World Futures, and Public Policy—A Critique__—Examines global models as a tool for long-range strategic analysis and policy development.

__Airport and Air Traffic Control System__—Examines the likely future evolution of domestic aviation.

*__Impact of Advanced Air Transport Technology__—Examines the impact of introducing or not introducing advanced high-speed aircraft into our future commercial fleet, including air cargo and commuter sectors.

*__U.S. Passenger Rail Technologies__—Assesses intercity passenger rail technologies, foreign experience with high-speed rail, and the potential impacts of their introduction in the United States.

*__Impact of Advanced Group Rapid Transit Technology__—Examines second-generation automated guideway transit systems as part of a solution to the need for improved urban mass transit.

__Automatic Train Control in Rail Rapid Transit__—Assesses technical, operational, planning, and policy issues arising from automated train control.

__Changes in the Future Use and Characteristics of the Automobile Transportation System__—Describes energy, environmental, safety, and cost impacts of technological changes.

__An Evaluation of Railroad Safety__—Evaluates trends in railroad-related accidents.

*__An Assessment of Technology for Local Development__—Assesses several prototype technologies, the local problems they may alleviate, and their feasibility and potential impacts.

__Space Science Research in the United States: A Technical Memorandum__—Summarizes and critiques the views of many people interested in space science.

__Coal Exports and Port Development: A Technical Memorandum__—Addresses four major issues that are important to Federal policy debate: estimating the potential U.S. coal export market, development of foreign trade policy, the Federal role in dredging harbors, and the outlook for alternative technologies.

__Ocean Margin Drilling: A Technical Memorandum__—Evaluates a proposed public-private cooperative research effort in marine geology.

__Recent Developments in Ocean Thermal Energy: A Technical Memorandum__—Reviews status of ocean thermal energy conversion (OTEC) developments occurring after OTA's 1978 report on OTEC.

*Summary available.

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